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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/537,781

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EXAMINER

GUGLIOTTA, NICOLE T

ART UNIT

PAPER NUMBER

1794

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,781	Applicant(s) NITTA ET AL.	
	Examiner NICOLE T. GUGLIOTTA	Art Unit 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 16 is/are pending in the application.
- 4a) Of the above claim(s) 12 - 16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :6/6/2005, 12/6/2005, 11/17/2006, 5/9/2007, 4/25/2008, 8/20/2008.

DETAILED ACTION

Election/Restrictions

1. Claims 12 – 16 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II (method of manufacturing), there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on March 27, 2009.

Applicant's election without traverse of claims 1 - 11 in the reply filed on March 27, 2009 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1, 3 & 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Harmer et al. (U.S. 5,512,368).**

In regard to claims 1 and 4, Herman et al. disclose fibers made from organic polymer (Col. 1, Lines 45 – 50) reinforced with inorganic whiskers, such as carbon nanotubes (Col. 2, Lines 55 - 57). The whiskers are particles having an average aspect ratio of about 5 or more, and an average diameter of about 0.1 to 1.5 μm (100 nm – 1500 nm) (Col. 2, Lines 43 - 54). A specific example of organic polymer used is poly(p-phenylene terephthalamide) (PPTA), which has

Art Unit: 1794

the structure $(-\text{NH}-\text{Ar}_1-\text{NH}-\text{CO}-\text{Ar}_1-\text{CO}-)_n$, where Ar_1 is a phenyl ring. Herman et al. disclose 18.1 g of whiskers (26% by weight) and 51.9 g of PPTA (74% by weight) were added toward the fiber composition (Col. 3, Line 60 - Col. 4, Line 2). The methods used aligned the long axis of the whiskers parallel with the long axis of the fiber (Col. 3, Lines 14 - 16).

In regard to claim 3, the degree of orientation is the measure of alignment. Since the nanotubes disclosed by Herman et al. are aligned with the fiber axis, it would have the same degree of orientation as claimed by Applicant.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 2 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harmer et al. (U.S. Patent No. 5,512,368), in view of Ebbesen et al. ("Large Scale Synthesis of Carbon Nanotubes", Nature, Vol. 358, page 220 (1992)).**

Harmer et al. is silent in regard to the type of carbon nanotubes used for their invention. However, Harmer et al. direct their readers to the reference of Ebbesen et al. in regard to the carbon nanotubes that may be used for their invention. Ebbesen et al. disclose their synthesized carbon nanotubes consist of

Art Unit: 1794

two or more concentric shells of carbon sheets (multi-walled carbon nanotubes) (Page 221, Figure 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the multiwalled nanotubes disclosed by Ebbesen et al. into the invention disclosed by Harmer et al.

The orientation factor is the measure of alignment. Since the nanotubes disclosed by Herman et al. are aligned with the fiber axis, it would have the same orientation factor as claimed by Applicant.

6. Claims 2 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harmer et al. (U.S. Patent No. 5,512,368), in view of Ebbesen et al., and further in view of by Veedu et al. (US 2004/0180201).

Harmer et al. is silent in regard to the type of carbon nanotubes used for their invention. However, Harmer et al. direct their readers to the reference of Ebbesen et al. in regard to the carbon nanotubes that may be used for their invention. Ebbesen et al. disclose their synthesized carbon nanotubes consist of two or more concentric shells of carbon sheets (multi-walled carbon nanotubes) (Page 221, Figure 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the multiwalled nanotubes disclosed by Ebbesen et al. into the invention disclosed by Harmer et al.

Harmer et al. disclose the methods used to manufacture their fiber aligned the long axis of the whiskers parallel with the long axis of the fiber (Col. 3, Lines

Art Unit: 1794

14 - 16). However, Harmer et al. are silent in regard to the specific values for the orientation factor. Veedu et al. disclose orientation factors of 0.90, 0.94 and 0.92, for nanotubes aligned along the axis of a composite fiber. These values are indicative of substantial nanotube alignment along the fiber axis ([0087]). It would be reasonable to believe the whiskers (i.e. nanotubes) of Harmer et al. have orientation factors of 0.90 or higher because the nanotubes of Harmer et al. also align with the long axis of the fiber.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harmer et al., in view of Tamura et al. (U.S. Patent No. 4,539,393) .

Harmer et al. disclose carbon nanotubes mixed with an aromatic polyamide, such as p-phenyleneterephthalamide, to form fibers. However, Harmer et al. are silent in regard to copolymerizing such a polyamide with a 3,4'-diaminodiphenyl ether unit. However, Tamura et al. disclose the copolymerization of p-phenyleneterephthalamide with 50 mol% 3,4'-diaminodiphenyl ether units (Example 15, Col. 17, Line 65 – Col. 18, Line 28) for producing films for fiber, paper and the like (Col. 1, Line 20). It would have been obvious to one of ordinary skill in the art at the time of the invention to copolymerize the p-phenyleneterephthalamide polymer in the fiber disclosed by Harmer et al. with 50 mol% 3,4'-diaminodiphenyl ether units, as disclosed in the fiber forming films of Tamura et al., in order to form dimensionally stable fibers with excellent mechanical, thermal, and electrical properties (Col. 1, Line 62 – Col. 2, Line 3).

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harmer et al., in view of Margrave et al. (US 2002/0110513 A1).

Harmer et al. is silent in regard to the proportion of oxygen atoms and carbon atoms on the surface of the nanotube. Margrave et al. disclose functionalizing the sidewalls of nanotubes with moieties that have chemical and steric properties to prevent the nanotubes from reassembling into bundles ([0018]). Suggested moieties include functional groups containing oxygen, such as hydroxyl groups, and acyl groups ([0065] – [0071], [0074]), attached to a carbon nanotube, due to nucleophilic substitution of fluorine. In a specific example of a nucleophilic substitution with methoxide, the product resulted in a C/F/O ratio of at least about 79/17/4 ([0143]). It is assumed the oxygen ratios are reflective of the number of methoxy groups present on the side wall of the nanotube, and therefore there are 4 oxygen atoms for every 79 carbon atoms. This equates to approximately 5 oxygen atoms for every 100 carbon atoms. Therefore, it would be obvious to one of ordinary skill in the art to functionalize a carbon nanotube surface with groups comprising oxygen in a ratio of 5 oxygen atoms for every 100 carbon atoms, as these groups prevent the nanotubes from reassembling into a bundle, as disclosed by Margrave et al.

9. Claims 8 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harmer et al., in view of Smalley et al. (WO98/39250).

In regard to claim 8, Harmer et al. are silent in regard to physical size reduction treatment of the carbon nanotubes of their invention. However, Smalley et al. disclose making a fibrous material comprising carbon nanotubes and applying a physical size reduction treatment, such as a sonication cutting treatment (Pg 26, Lines 23 - 25) and exposure to acid (Pg 27, Lines 20 - 25). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a physical size reduction treatment to the carbon nanotubes disclosed by Harmer et al. because carbon nanotubes should be cut to a length to prevent tangling (Pg 25, Lines 1 – 5).

In regard to claims 9 & 10, Harmer et al. are silent in regard to acid treatment and esterification of the carbon nanotubes of their invention. However, Smalley et al. disclose oxidation by strong acid treatment, resulting in esterification of the carbon nanotubes (Pg. 22, Line 13 – Pg. 23, Line 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to oxidize nanotubes in order to remove amorphous carbon deposits and other contaminating material (Pg 22, Lines 1 - 5), which would result in esterification of the carbon nanotubes, as taught by Smalley et al.

10. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harmer et al., in view of Niu et al. (US 2003/0089893 A1).

Claim 11 defines the product by how the product was made (i.e. amidation of a carbon nanotube after treatment with a strong acid and esterification). Thus, claim 11 is a product-by-process claim. For purposes of examination, product-

Art Unit: 1794

by-process claims are not limited to the manipulation of the recited steps, only the structure implied by the steps. See MPEP 2113. In the present case, the recited steps imply a structure having an amide functional group bonded to a carbon nanotube after oxidation. The references suggest such a product.

Examiner refers applicant to MPEP § 2113 [R - 1] regarding product-by-process claims. "The patentability of a product does not depend on its method or production. If the product in the product-by-process claim is the same as or obvious from a product or the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777, F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citation omitted)

Once the examiner provides a rationale tending to show that the claimed product appears to be same or similar to that of the prior art, although produced by a different process, the burden shifts to the applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. *In re Marosi*, 710 F.2d 798, 802, 218, USPQ 289, 292 (Fed. Cir. 1983)

Harmer et al. is silent in regard to functionalizing the carbon nanotubes of their invention with an amide group. However, Niu et al. disclose a carbon nanotube can be functionalized by converting the carboxylic acid group to an amide by a chemical reaction with amines (¶ [0100] – [0101]). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to functionalize the carbon nanotubes of Harmer et al., such as by amidation, in order to improve the chemical bonding between the nanotubes and

Art Unit: 1794

a substrate, such as a polyamide polymer (¶ [0022], [0088] – [0089]), as taught by Niu et al.

Double Patenting

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 1 – 6 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 – 4 and 17 - 21 of copending Application No. 10/542,641. Although the conflicting claims are not identical, they are not patentably distinct from each other because both applications disclose carbon nanotubes combined with the same specific aromatic polyamides, in the same proportions. Therefore, it would have been

Art Unit: 1794

obvious to one of ordinary skill in the art that the Application of 10/542,641 and the present application would result in a final product of the same composition.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE T. GUGLIOTTA whose telephone number is (571)270-1552. The examiner can normally be reached on M - F 8:30 - 6 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Sample can be reached on 571-272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1794

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David R. Sample/
Supervisory Patent Examiner, Art Unit 1794

NICOLE T. GUGLIOTTA
Examiner
Art Unit 1794